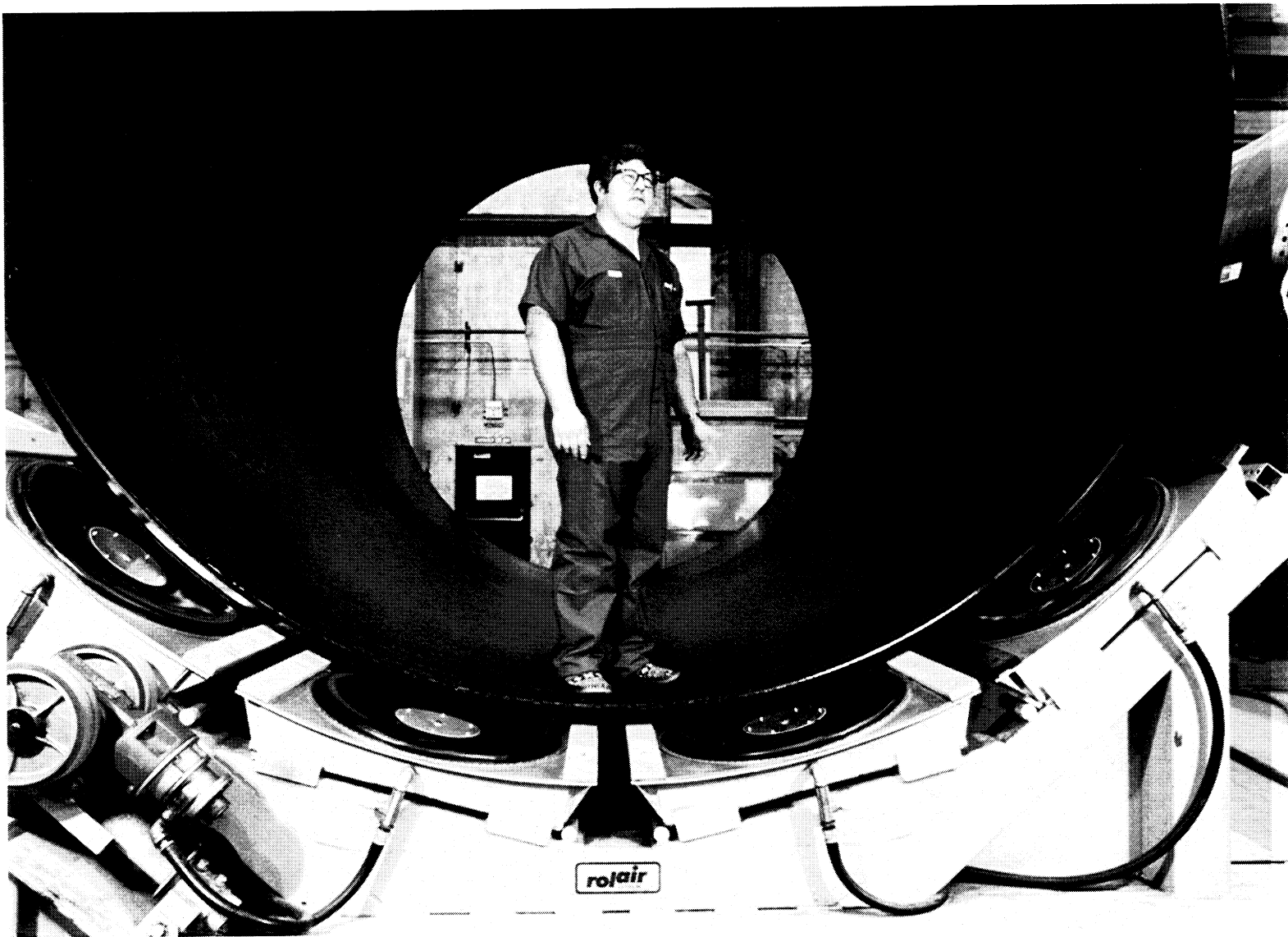


Among a sampling of spinoffs in manufacturing technology and industrial productivity is a line of air flotation systems for moving heavy loads

Transportation By Air— On the Ground

at its Bacchus Works in Magna, Utah, Hercules Incorporated is building advanced filament-wound casings for the Space Shuttle's solid rocket motors. Use of the filament winding technique and graphite composite material

sharply reduces the weight of the rocket motors, hence increases the amount of payload that can be boosted to orbit. To be introduced to Shuttle operations next year, the 115-foot cases are 32 tons lighter than the steel cases now in use—



but they are nonetheless large and heavy, built in segments 12 feet in diameter and 20 to 27 feet long. In the course of construction, these segments must be moved from place to place. Such movement is easily accomplished by means of a spinoff Rolair air flotation system, an outgrowth of air bearing technology developed by NASA and General Motors Corporation.

The need for this technology arose during development—in the early 1960s—of the mammoth Saturn V booster for Apollo lunar

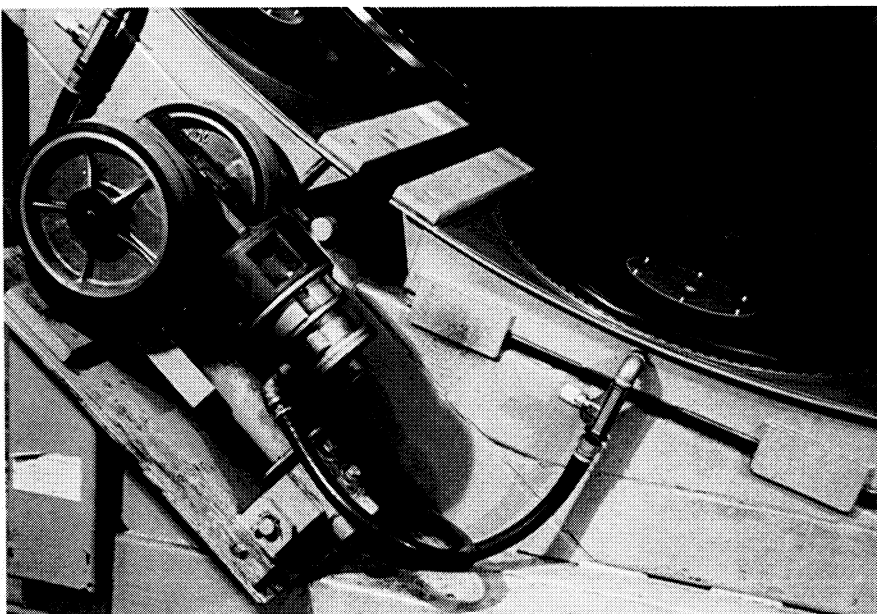
missions, the largest vehicle ever flown in the free world. The 364-foot superbooster was, of course, built in segments but some of the segments weighed more than 100,000 pounds—and they had to be moved during construction and assembly.

In 1963, Marshall Space Flight Center, Saturn V program manager, contracted with General Motors' Defense Research Laboratory for design, fabrication and test of an air bearing system that would facilitate movement of heavy

Saturn V components. The core of the system was an air flotation device earlier invented by General Motors; its use in the Marshall development was the first large scale application of the technology.

The basic idea of the air bearing system is to separate the load from the ground by a thin cushion of air, virtually eliminating surface friction and enabling easy movement of heavy loads in any direction. The air bearings are elastic diaphragms inflated with air. During their operation, controlled

At a Hercules Incorporated plant in Utah, multi-ton rocket cases are moved easily by a Rolair system that virtually eliminates friction between the load carrying pallet and the plant floor. The 12-foot diameter cases "float" on air bearings, shown in closeup at right.



leakage of air creates a lubricating film between the load's pallet and the underlying surface. With friction thus minimized, it becomes possible to move loads at a one-to-one thousand force/weight ratio—meaning that a force of 150 pounds will move a load of 150,000 pounds.

In the mid-1960s, a group of General Motors engineers who had worked on the Marshall/General Motors air bearing system obtained a General Motors license for the technology and formed a company that subsequently became Rolair Systems. The company refined the technology and developed a broad line of air film transporters, turntables and air cushions for frictionless movement of practically any type of moderate to heavy load.

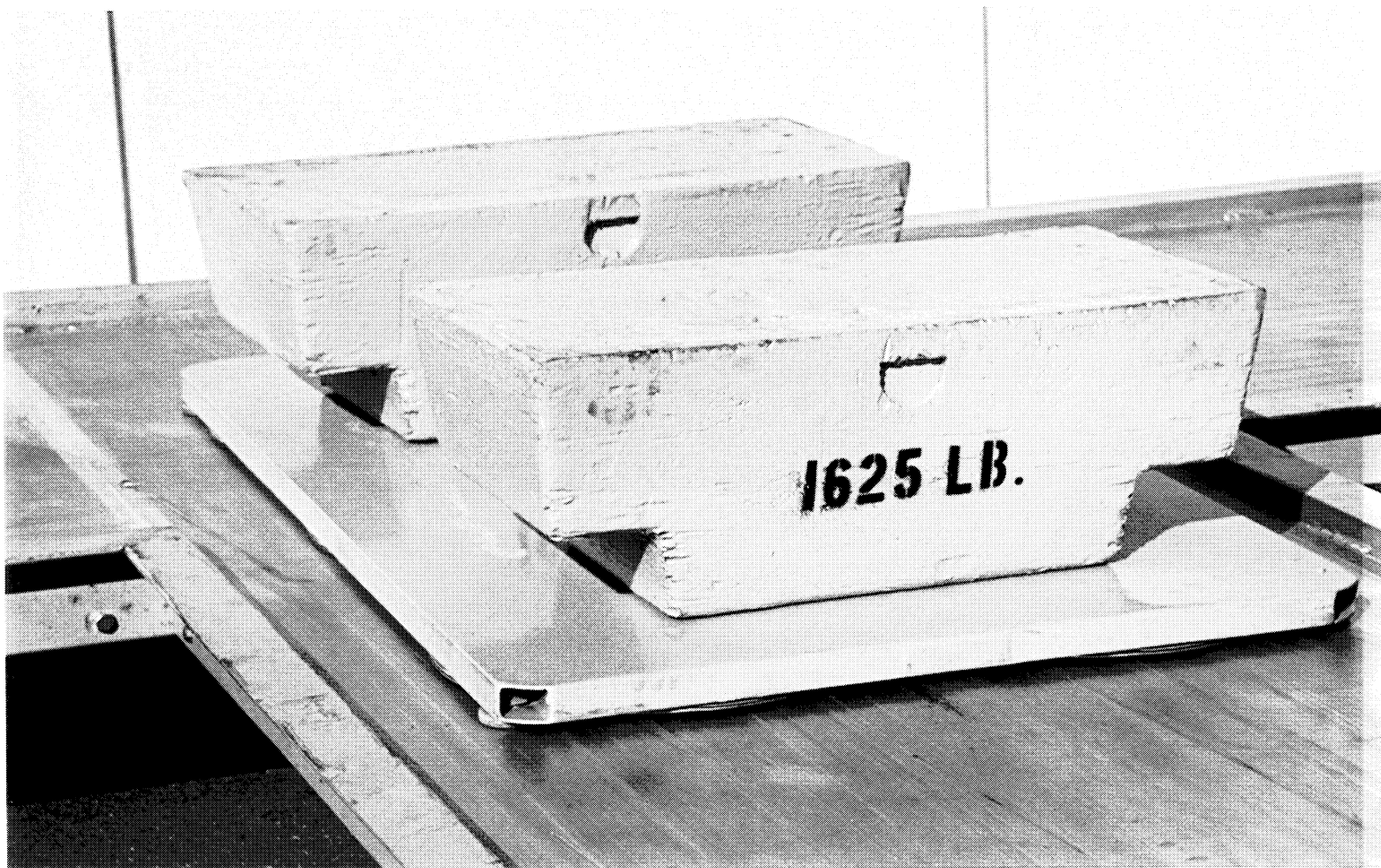
A challenging development in Rolair's early days was a system to move the world's largest jetliner,

the Boeing 747, which has an empty weight of some 300,000 pounds. Rolair equipment has also been used by LTV Aerospace and Defense Company for lifting and assembling aircraft components, and by Rockwell International for movement of 150,000-pound titanium packs in aircraft construction operations.

Non-aerospace applications include a system capable of moving more than one million pounds of factory-built home modules from one assembly station to another; "floating" 60-ton Allis-Chalmers crawler tractors along the production line; and rearranging audience seating for TV and stage productions by sliding large sections of seats on an air film. A related assignment successfully handled by Rolair was development of a system for Hawaii's Aloha Stadium to shift

four 7,000-seat sections and convert the stadium to optimum configuration for football, baseball, other sports and special events.

Since formation of the company, air flotation movement systems have been Rolair's speciality. The company has experienced substantial growth with increasing industrial acceptance of air film movement equipment and Rolair is now producing more than 100 standard systems in addition to customized designs. As part of this continued development, a new U.S. company has been formed: Hovair Systems Inc., Ventura, California, which combines Rolair's specialized experience with the broader industrial expertise of Hovair Systems Limited of England, Europe's foremost air film company.



Rolair equipment includes more than 100 types of air flotation systems for moving moderate to heavy loads. At left is a standard industrial-use transporter carrying a weight of 1,625 pounds; at right, six company employees add their weight to that of the metal blocks to demonstrate additional capacity.

